

ATRIPLEX ASTEROCARPA (CHENOPODIACEAE),
A NEW SPECIES FROM SOUTHERN UTAH AND
NORTHERN ARIZONA

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ABSTRACT

Atriplex asterocarpa is a newly described annual species from southern Utah and northern Arizona. It occurs most often on slopes of the Chinle Formation. It is morphologically closest to *A. saccaria* but differs in its long-petioled leaves, globose fruiting bracts and indurate, sharp-pointed, conical fruiting-bract appendages.

A morphologically distinct, new annual species of *Atriplex* was discovered by the first author, 20 June 1973, on a south-facing slope in talus derived from the Chinle Formation near Hite Crossing, ca. 10 miles southeast of Hog Spring, T33S R13E S1, Garfield Co., Utah. Examination of all annual species of *Atriplex* in several herbaria (ASC, BRY, CAS, GH, MONT, NY, RM, RSA, UC, US, UT and UTC) showed twelve previous collections of the new species. They were each labelled *A. saccaria* S. Watson.

Atriplex asterocarpa Stutz, Chu and Sanderson, sp. nov. (Fig. 1).—

TYPE: USA, Utah, Garfield Co., ca. 5 mi SE of Hog Spring, Highway 95, mile marker 39, T34S R13E S1, 1280 m, 23 Jul 1991, *H. C. Stutz 95575* (type, BRY).

Herbae annuae, 15–30 cm altae; caulis erectus vel ascendens, multo ramosus a basi ad apicem; rami oblique patuli, fere teres, in parte superiore dense furfuracei, in parte inferiore glaberi. Folia alterna, petiolata; laminae ovatae usque anguste-ovate, 1–2.5 cm longae, 0.5–1.5 cm latae, apice acutae, basi cuneatae, integri, utrinque dense furfuracea; petioli 2–12 mm longi. Planta monoecia; staminales flores brevissimis pedicellis; glomerati, in terminales spicas 1–3 cm longos; perianthium fere globosum, circa 1.2 mm in diam.,

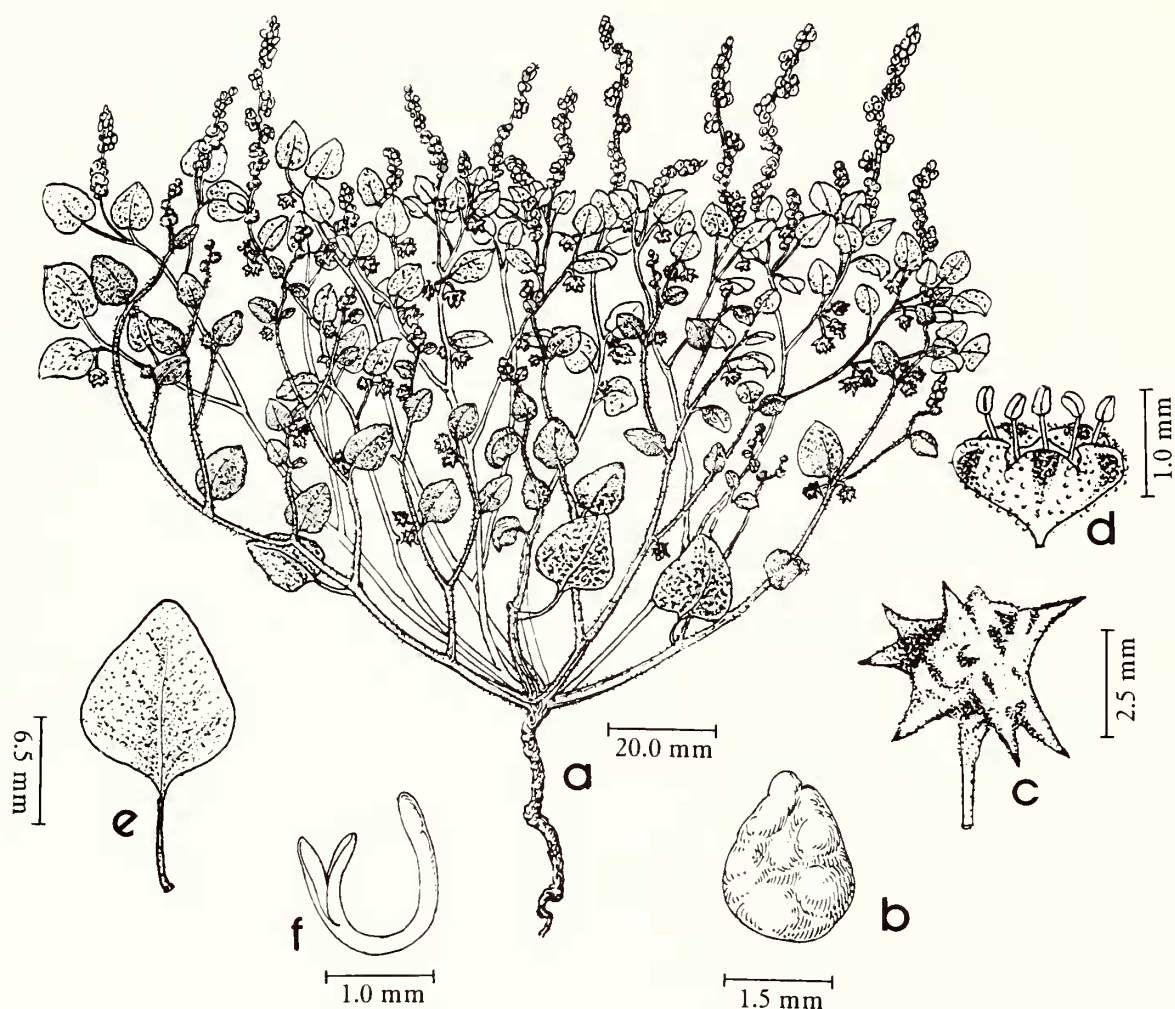


FIG. 1. *Atriplex asterocarpa*. a. Habit. b. Seed. c. Fruiting bract. d. Male flower. e. Leaf. f. Embryo. (Drawings by Xia Quan.)

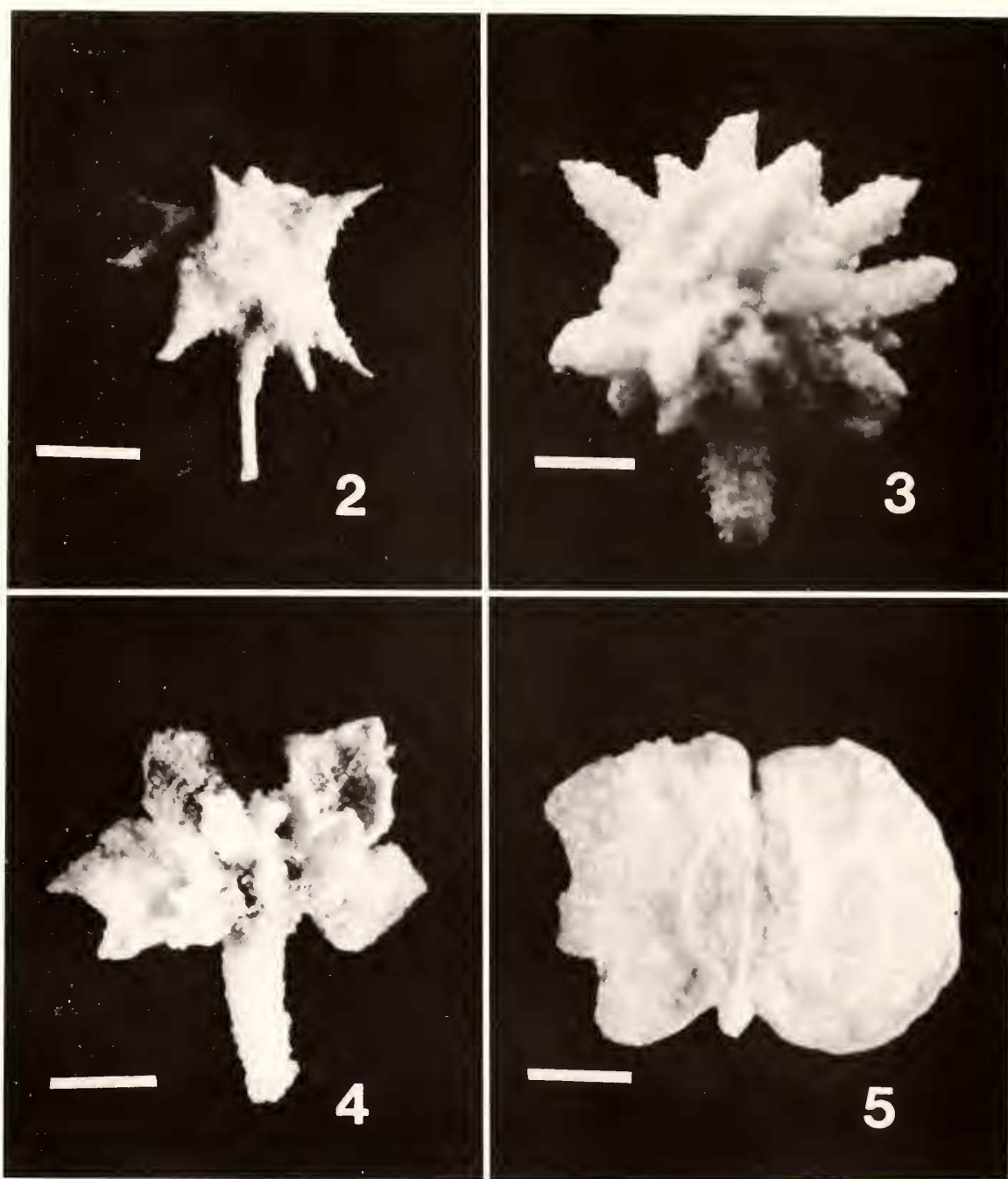
5-partitum, segmentis oblongo-ovatis, membranaceis, circa 0.9 mm longis, extus furfuraceis; stamina 5, antheris circa 0.4 mm longis et filamentis segmentis leviter brevioribus; pistillati flores glomerati in fere omnium foliorum axillis sub staminatibus inflorescentiis, bracteolis connatis ad vertices, stigmis 0.4–1.2 mm longis et style inconspicuo; fructiferi bracteae globosae, 5–6 mm in diam., saepe cum stipite 2–4 mm longi, perfecte obducti appendicibus conoideis, induratis, apice pungentibus. Utriculus ovatus; semen circa 2.5 mm longum, testa membranacea, rubri-brunneola et radicula supera. Chromosomatum numerus $2n=18$. Proxima *A. saccariae* S. Wats. et *A. cornutae* Jones, illa differt foliis cordatis et sessilibus, haec differt appendicibus molliter columnaribus.

Annual herb, 15–30 cm tall. Stems erect, with crowded branches from base to top, the branches oblique-spreading or decumbent, nearly terete, basal part glabrous, terminal part densely scurfy. Leaves alternate, mostly long-petioled; blades ovate to narrow-ovate, 1–2.5 cm long, 0.5–1.5 cm wide, acute at apex, cuneate at base, entire,

densely scurfy on both surfaces, venation kranz-type; petiole 2–10 mm long. Plants monoecious; staminate flowers with short pedicels, glomerules in spikes 1–3 cm long at end of branches; perianth nearly globose, ca. 1.2 mm in diam., 5-parted, segments oblong-ovate, membranaceous, ca. 0.9 mm long, scurfy abaxially; stamens 5, anthers ca. 0.4 mm long, filaments slightly shorter than perianth segments. Pistillate glomerules in axils of most leaves; bracteoles fused to summit; stigma 0.4–1.2 mm long, style inconspicuous; fruiting bracts globose, 5–6 mm in diam., with several cone-shaped, indurate, sharp-pointed appendages on both surfaces, scurfy, usually with a stipe 2–4 mm long. Utricle ovate; seed ca. 2.5 mm long, tests membranaceous, red-brown, radicle superior. Chromosome number: $2n=18$.

PARATYPES: USA, Utah, Garfield Co.: top of Entrada Sandstone, ca. 4 miles N of Utah Hwy 96 junction with Burr Trail Road, 3 Sep 1970, *S. L. Welsh 10898* (NY, BRY); ca. 5 mi SE of Hog Spring, Hwy 95, T34S R13E S1, 20 Jun 1973, *H. C. Stutz 7247* (NY, BRY); 1.9 miles NW of Hite Crossing, Highway 95, 20 Jun 1973, *H. C. Stutz 7279* (BRY); due NW of Bullfrog on Shitamaring Road, 4500 ft elevation, 29 Jun 1977, *E. Neese and S. White 3446* (BRY); Talus slopes, about 10 mile S of Hite, 130 miles N of Glen Canyon dam site, Colorado River, 22 Jun 1973, *H. C. Stutz 7255* (NY, BRY, UT); Bullfrog creek crossing on Notom Road, 3750 ft elevation, 18 Jun 1977, *E. Neese and S. White 3438* (NY, BRY); ca. 3 miles NW of Hite Crossing, Hwy 95, mile 39, west-facing slopes, 5 Jun 1992, *H. C. Stutz 95634* (BRY); Bullfrog Marina, 2 miles W of Hwy 276 on Nodom Road, 21 May 1993, *H. C. Stutz 95807*. San Juan Co.: Junction of Nokai Creek and San Juan River, 19 miles NW of Oljeto Post, 18 Jun 1938, *H. C. Cutler 2276* (UC, GH, MO, US); Piute Canyon, ca. 6 miles E of Navajo Mt. 24 Jun 1973, *N. D. Atwood and Trotter 5353* (BRY); White Canyon, salt desert, 1250 m elevation, 10 Aug 1983, *L. C. Higgins 14183* (NY, BRY); Clay Hills Divide, ca. 2130 ft elevation, 23 May 1983, *L. C. Higgins and S. Welsh 13229* (NY, BRY); White Canyon, Lake Powell, 3800 ft elevation, Chinle form. Shadscale comm. 13 May 1983, *S. L. Welsh 22015* (NY, BRY, RM); NE $\frac{1}{4}$ S25 T35S R13E, lower SW flank of mesa ca. 1 mile, ca. 3950 ft elevation, dissected slopes/badlands of Chinle Formation, 3 May 1987, *J. S. Tuhy and J. S. Holland 3090* (UT); Blue Notch, $\frac{1}{2}$ mi west of Summit, T35S R13# J36, 8 Apr 1993, *H. C. Stutz 95761*. Arizona, Coconino Co., vic. Vermillon Lodge, steep rocky south slope, 4200 ft elevation, 18 Apr 1978, *R. K. Gierish 4194* (ASC); Lee's Ferry, south-facing slope, Chinle Formation, 23 May 1993, *H. C. Stutz 95792* (BRY).

Taxonomic relationships. *Atriplex asterocarpa* superficially resembles *A. saccaria* Wats. and *A. cornuta* Jones, but is easily distin-



FIGS. 2-5. Fruiting bracts of the four *Atriplex* species in Series *Saccariae* (scale bars = 2 mm). 2. *A. asterocarpa*. 3. *A. cornuta*. 4. *A. saccaria*. 5. *A. graciliflora*.

guished from them by its long-petioled leaves and its long-pedicelled, globose fruits that are profusely covered with indurate, conical, sharp-pointed appendages (Fig. 2). Also, *A. asterocarpa* never produces small, cuneate, truncate, smooth-surfaced fruits as found, usually in few numbers, on most plants of *A. saccaria* and *A. cornuta*.

Atriplex asterocarpa also superficially resembles *A. graciliflora* Jones but *A. graciliflora* is easily distinguished by the pair of broad wings produced on its fruiting bracts (Fig. 2).

Atriplex asterocarpa, *A. saccaria*, *A. cornuta* and *A. graciliflora* appear to form a natural distinguishable group (Series *Saccariae*),

collectively distinct from other species of *Atriplex* in several features including the formation of a double layer of persistent, vesicular, usually stalked, trichomes on their foliage and fruits. During the life of the plant and even after drying, these spherical trichomes remain intact, thereby resulting in a sandpaper appearance to the vegetative surfaces. In contrast, trichomes of other *Atriplex* species break open soon after forming, resulting in vegetative surfaces having a flat, glistening, furfuraceous appearance. Also *A. asterocarpa*, *A. cornuta*, *A. Graciliflora*, and *A. saccaria* are all endemic to the Colorado Plateau of Utah, Arizona, New Mexico and Colorado and unlike most other annual *Atriplex* species, grow primarily on badland clay soils, often in monocultures, or with only a few other associated species. All four species are consistently diploid with $2n=18$ chromosomes (determined from aceto-carmines squashes of pollen-mother-cells derived from anthers of staminate flowers fixed in 5% acetic acid and stored in 70% ethyl alcohol).

Distribution and habitat. *Atriplex asterocarpa* is sporadically abundant in southeastern Utah and northern Arizona. It is mostly restricted to soils derived from the Chinle Formation, but some populations north of Lake Powell, Garfield County, Utah, occur on Entrada sandstone. At Hite Crossing it is abundant on two large talus slumps derived from the higher up Chinle Formation but is absent from adjacent Moenkopi soils. Northwest of Hites Crossing in North Canyon, along Highway 95, dense populations occur wherever the Chinle Formation is exposed; particularly large populations, each covering 2–3 acres, occur on southwest-facing slopes above mile markers 37 and 40. At Blue Notch, ca. 25 miles southeast of Hites Crossing, there is a dense population of *A. asterocarpa* (ca. 6 plants per ft²) occupying approximately 2 acres, on the southwest-facing slope ¼ mile below the summit. Near Lee's Ferry, Coconino County, Arizona, there are several populations on the Chinle Formation, north of the Marino, ½–3 acres in size, with densities of about 4 plants per ft².

Associated species. *Atriplex asterocarpa* often grows as a monoculture with no other attending plant species but in some populations the following species are sporadically present: *Atriplex confertifolia* (Torr. & Frem.) Wats., *Atriplex garrettii* Rydb., *Atriplex navajoensis* Hanson, *Bromus rubens* L., *Ephedra viridis* Cov., *Eriogonum inflatum* T. & G., *Stanleya pinnata* (Pursh) Britt.

Phenology. Flowering and fruiting is mostly in April and May but with late May and June rains, new seedlings may appear that flower into June and July.

During the summer and fall of 1989 and 1990 repeated searches revealed no plants of the new species in areas that were known to

have been heavily populated by them in previous years. However, during the summers of 1991, 1992 and 1993 these same areas were again occupied by dense populations, indicating that *A. asterocarpa* seeds can remain dormant and viable in seed banks for at least three years.

Seedlings derived from seeds, and seedlings transplanted from native populations, when grown in the greenhouse and nursery at Brigham Young University, Provo, UT, maintained all of the characteristics of plants growing in nature.

KEY TO *ATRIPLEX* SPECIES IN SERIES *SACCARIAE*

1. Fruiting bracts with broad marginal wings, unappendaged *A. graciliflora*.
- 1'. Fruiting bracts without marginal wings, bracts appendaged.
 2. Fruiting bracts covered with conical appendages, leaves cuneate at base, distinctly petiolate.
 3. Appendages indurate, sharp-pointed *A. asterocarpa*
 - 3'. Appendages flexible *A. cornuta*
 - 2'. Fruiting bracts with flattened appendages, leaves sessile or subsessile, cordate or subcordate *A. saccaria*

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